THE WIZARD OF WID'S WIZ MATH™

A MATH GAME FOR AGES 8 & UP

APPLE
II/II+/IIc/IIe
48K DISK
SRL-033

SIERRA™

THE WIZARD
OF ID'S

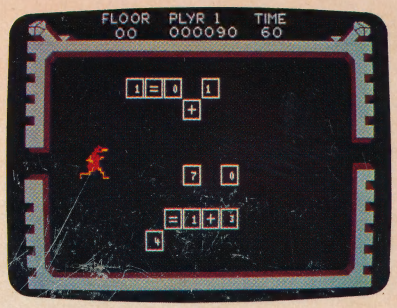
WIZ MATH™

SIERR

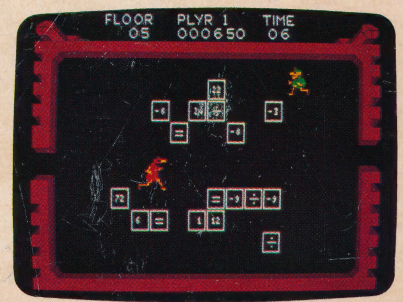
The Wizard of Id's Wiz Math™

Only by forming true mathematical equations can you outsmart the jailer and help the Spook escape from his castle dungeon.

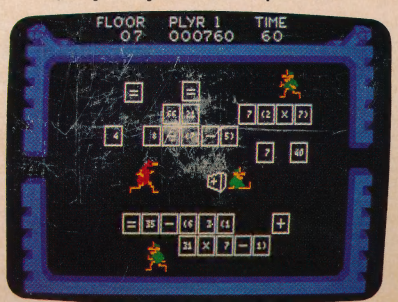
- **Skill Focus:**
  - Creating equations
  - Sharpening mental calculations
  - Applying +, —, x, and ÷ operations
  - Using decimal, binary and hexadecimal numbers
- **User Guide teaches math concepts**
- **No previous knowledge necessary**
- **Two can play competitively**



11 levels of fun with arithmetic and algebra.



Select your age level and play at your own pace.



Challenge yourself!

SIERRA™

Sydney

SRL-106

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Wizard of Id's
WizMath™
WML-100

Load "*", 8, 1

WIZMATH™
REFERENCE CARD

Designed by Sydney Development Corp.
Apple Version programmed by Chuck Benton

LOADING INSTRUCTIONS

1. Insert the WizMath disk, label side up, into the disk drive and close the drive door.
2. Turn on power to the computer and monitor.
3. IIe/IIc owners: your CAPS LOCK key must be off (up).
4. When the title page appears, WizMath will ask you to choose your controls. Press the lower joystick button to select the joystick, any key to select the keyboard.
5. The computer will ask you how many people will play WizMath. Type in a number from 1 to 6 and press RETURN.
6. When the computer asks your name, type it in and press RETURN. If you have played WizMath before, you will see a graph of your previous scores. Press any key to continue.
7. The computer will ask your age. Type in a number and press RETURN.
8. Repeat steps 6 and 7 for each player.
9. In a few moments, Spook will escape from his cell and the WizMath elevator will appear.
10. Use the up and down directional controls (joystick or keyboard) to select a floor. Then press the lower joystick button (or ◄CTRL►◄F► if you're using keyboard controls) to exit the elevator and explore the floor.

These control keys are operative when either joystick or keyboard controls are chosen.

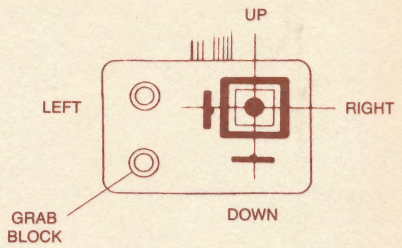
◄ESC►	Returns to elevator from a cell
◄CTRL►◄C►	Lists all files on the disk, including your own lessons (Floor 14 only)
◄CTRL►◄S►	Turns sound off/on
◄CTRL►◄R►	Restarts game

JOYSTICK CONTROLS

Use the joystick to move Spook left, right, up and down. When the joystick is centered, Spook should not move.

Press the lower joystick button to grab a block and drag it; releasing the button will cause Spook to drop the block.

To kick a block, simply face the block and move the joystick in the direction of the block.



KEYBOARD CONTROLS

◄I►	moves Spook up
◄K►	moves Spook down
◄J►	moves Spook left
◄L►	moves Spook right
SPACEBAR	stops Spook
◄CTRL►	Press the CONTROL key and a direction key to grab a block and drag it; releasing both keys and pressing any other direction key should cause Spook to drop the block. Note: it is safer (although slightly slower) to stop Spook (SPACEBAR) before dropping a block -- otherwise he might either continue carrying it, or even kick it.

SIERRA™

Sydney

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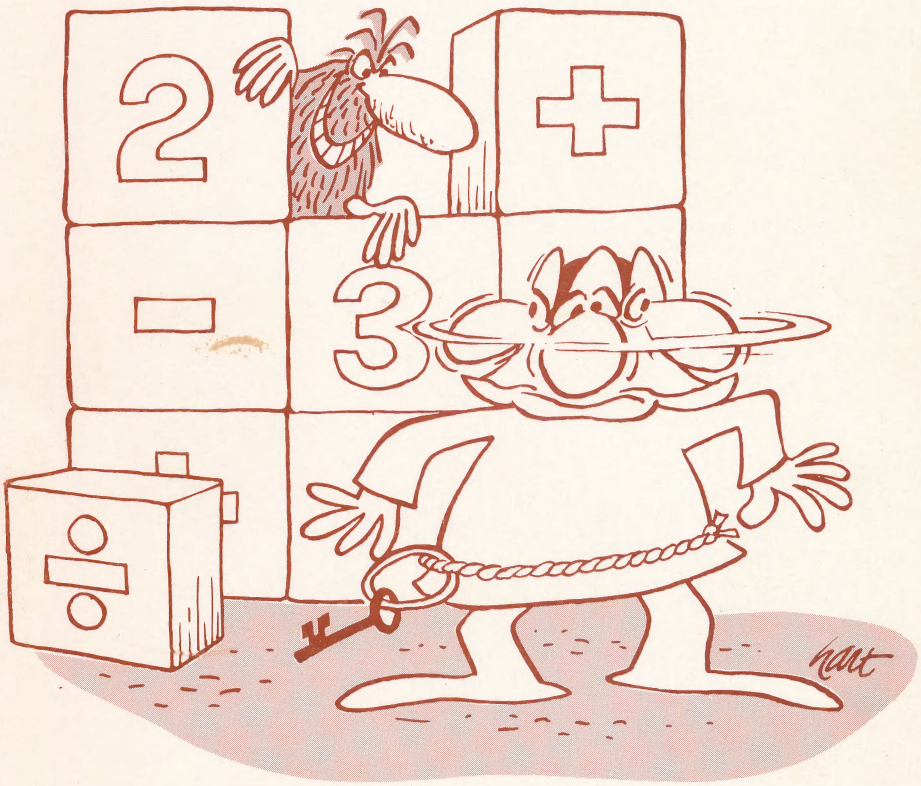
THE WIZARD OF ID'S

WIZMATH™

A MATH GAME FOR AGES 8 & UP



THE WIZARD OF ID'S

WIZMATH™

Designed by
Sydney Development Corp.

TO PARENTS

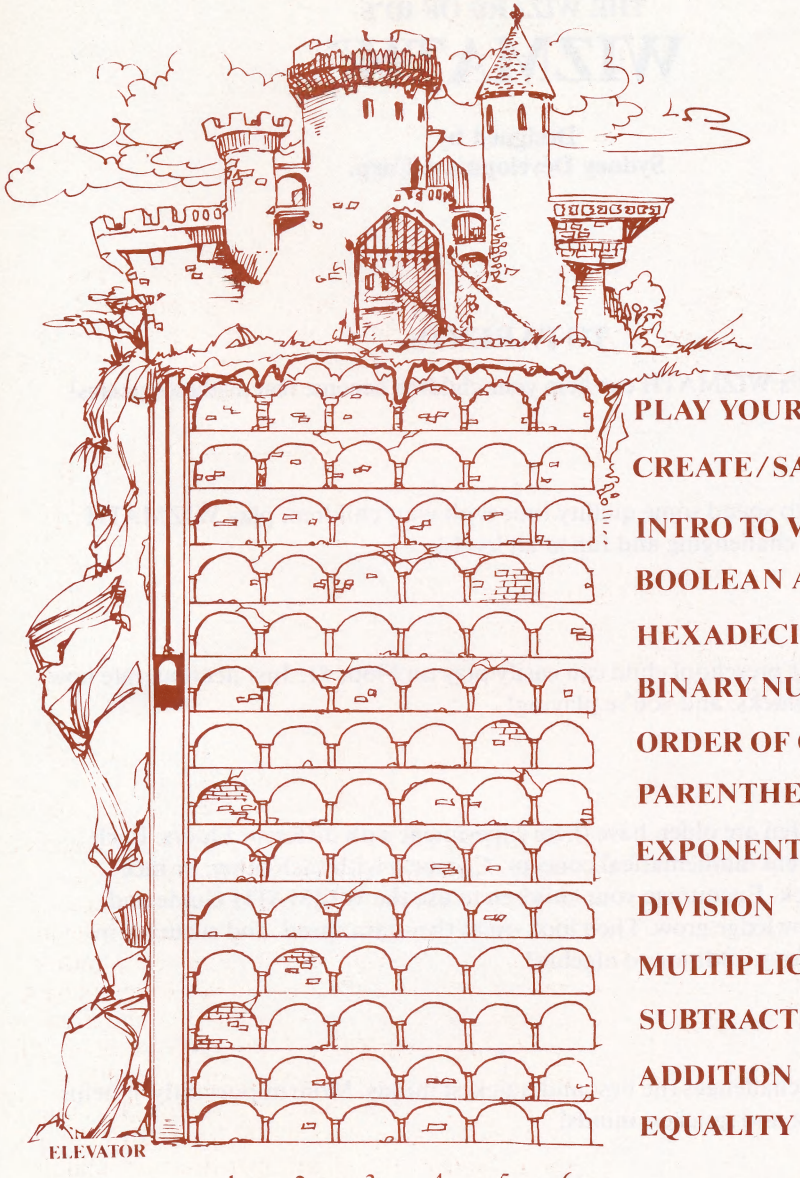
Wizard of Id's WIZMATH can help your children become real mathemagicians!

If you want to spend some quality time with your children, play WIZMATH with them. It's challenging and fun at all levels!

You and your preschool child can easily play on Floor #1. Just demonstrate how Spook moves blocks, and you're playing!

If your children are older, have them experiment with different Floors. Each teaches a different mathematical concept. Compete with each other, or race against the clock. Encourage your children to use the WIZMATH Guide and watch their knowledge grow. Then look on as they gain speed and accuracy in mathematics, from addition to algebra!

WIZMATH challenges the best and quickest minds. More importantly, it helps develop the best and quickest minds!



PLAY YOUR OWN GAMES*

CREATE/SAVE A GAME*

INTRO TO VARIABLES*

BOOLEAN ALGEBRA

HEXADECIMAL NUMBERS

BINARY NUMBERS

ORDER OF OPERATIONS

PARENTHESES

EXPONENTIATION

DIVISION

MULTIPLICATION

SUBTRACTION

ADDITION

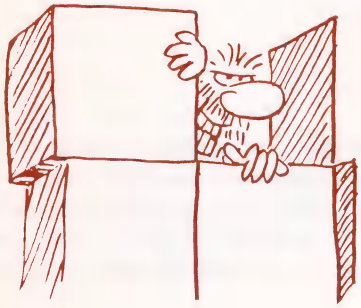
EQUALITY

*not in all versions

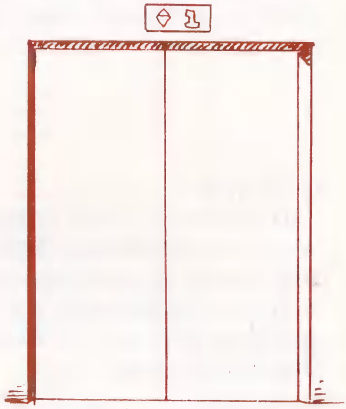
WIZMATH™

Your Guide to Mathemagic!

by W. Edward Willy, PhD
and Annette Childs



How-de-do! Call me Spook. I've escaped from my prison cell, and I'm on the run. If you're a mathemagician you can help me avoid the jailors as I search for a way out of the castle dungeon!



The Elevator provides a shortcut to the surface. But the closer I get to the top, the harder it is to avoid the jailors. Those dratted Turnkeys are eager to lock me up in my cell again. Maybe I'll just lay low for awhile, and quietly explore the lower floors.

Entering a dungeon cell from the left, I discover many blocks just lying around. A number or mathematical symbol is painted on each block. I just love to push blocks, so I shove one up against another. Lo and behold, I have created a mathematical equation! It's easier to move around now, because the blocks I used to make the equation just disappeared. This is FUN. I'll try another! I'll just kick that block into place and . . . hey! Not only did my second equation disappear too, but now a door has opened at the right side of the room. I move through the open doorway, and the adventure continues . . .

GET READY...

Load WIZMATH by following the instructions on your Reference Card. After the title page appears, the program will ask, "How many players?" Up to six people may play WIZMATH at one time (some versions vary). Consult your Reference Card to learn how to enter the number of players.

The computer will ask your age, which determines your beginning skill level. WIZMATH will recommend on which floor you should start (you may start on a different floor if you wish). Your age will also determine how many Turnkeys will chase you at the start. Age also affects scoring—for instance, if you are 8 and your sister is 12, you will earn more points than she will for creating the same equations.

GET SET...

The kingdom of Id's prison contains floor upon floor of adjoining cells crammed with giant blocks. By arranging them to form correct mathematical equations you can earn points and advance to the next, more challenging cell, learning as you go.

GO!

Use a joystick or keyboard controls to move Spook around each cell. To create an equation, grab blocks and drag them, or simply kick them into place. (Read your Reference Card to learn how.) When enough blocks are used, a door will open on the right. You can go through it to discover another slightly more challenging room. Or you can exit to the left at any time to return to the elevator. You can then choose another floor if you want to practice another lesson (on anything from addition to algebra).

STRATEGY

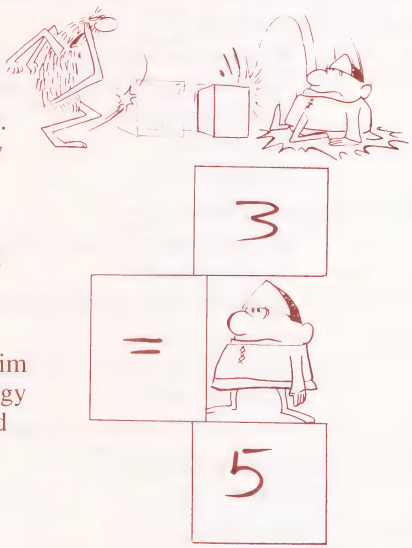
The object of WIZMATH is to create correct equations using the same as or equals [=] sign. For example, when you put together the blocks [6][=][5][+][1], you are saying that [6] is the same as, or equal to, [5][+][1]. It's that simple!

Note that in some WIZMATH versions, combinations which give results larger than 99 or less than −9 at any stage of evaulation, such as the equation $-8 + -5 + 12 = -1$, will not work. The result after the first step is −13, a number not covered in all versions.

If you first want to get comfortable controlling Spook, tell WIZMATH you are 4 years old, and explore the first floor. There will be no Turnkeys to bother you.

Turnkeys

The Turnkeys do their best to capture Spook as he wanders through the dungeon. The higher your skill level, the craftier they are. But there are ways to outwit them.



If you kick a block into a Turnkey, you'll knock him off his feet.

You can also trap a Turnkey. Surround him with blocks, and he can't move! This strategy works best if you use blocks you don't need right away.

Scoring

A bonus clock keeps track of how fast your Spook correctly lines up blocks. Extra points are earned if Spook can quickly line up blocks and get through the right-hand door.

Using the WIZMATH Guide

If you get stuck on a floor, you can find an explanation of the concept taught on that floor in the WIZMATH Guide. Consult the Floor Directory on page 6.

You may find that you need to go back to other floors as well. For example, in order to fully understand Binary Numbers, (Floor 9) you need to understand Position Values, which are first discussed on Floor 2.

FLOOR DIRECTORY

*not in all versions

Floor 1 Equality [=] ..... page 7
The Decimal number system

Floor 2 Addition [+] ..... page 8
Position values
Number Order
Addition using position values
Addition of negative numbers

Floor 3 Subtraction [−] ..... page 12
Subtraction of positive numbers
Subtraction of negative numbers
Position values
Borrowing
Number Order

Floor 4 Multiplication [×] ..... page 14
Multiplication of positive numbers
Number Order
Multiplication of negative numbers

Floor 5 Division [÷] ..... page 16
Division of positive numbers
Number order
Division of negative numbers

Floor 6 Exponentiation [^] ..... page 18
Number Order

Floor 7 Parentheses [(] [)] ..... page 19

Floor 8 Order of Operations ..... page 19

Floor 9 Binary Numbers ..... page 20

Floor 10 Hexadecimal Numbers ..... page 22

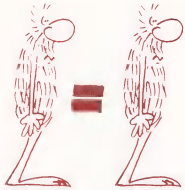
Floor 11 Boolean Algebra [AND] [OR] ..... page 24
Order

*Floor 12 Introduction to Variables [×] ..... page 26
Addition of variables
Subtraction of variables
Multiplication and Division of variables

*Floor 13 Create / Save Your Own Games ..... page 28

*Floor 14 Play Your Own Games ..... page 29

FLOOR 1
Equality



All right all you mathemagicians out there, look alive. You can help me through the cells on Floor 1 by matching any number with another that looks exactly like it. These are all examples of winning matches: [1] = [1] [4] = [4] [9] = [9]

[6] [=] [6]

With the joystick (or keyboard controls), help Spook kick or drag blocks to make winning matches. For instance, drag an equals or same as block [=] between two [6] blocks to get [6] [=] [6]. This is a correct equation because one [6] is equal to, or the same as, another [6]. Spook can also kick [6] into [=] [6] to get the same result. Either way, you'll earn points for creating the equation. Then the blocks you used will disappear.

The Decimal Number System

On Floor 1 you'll come across these ten characters:

[0] [1] [2] [3] [4] [5] [6] [7] [8] and [9].

Together, they make up the Decimal Number System. You can show each number on your hands:

[0] means

[1] means

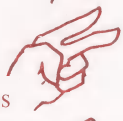
[2] means

[3] means

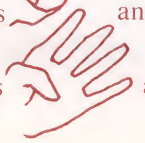
[4] means

[5] means

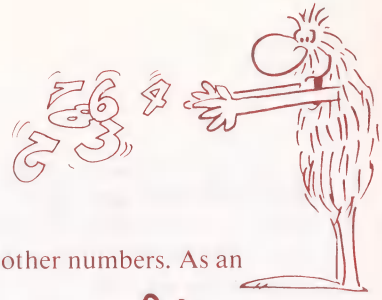
[6] means and

[7] means  and

[8] means and

[9] means  and

FLOOR 2
Addition



Addition is a way of putting numbers together to get other numbers. As an example, if you

put together with you get

which looks like [1] [+] [2] [=] [3] .

You may be more used to adding numbers in column form. Here is the same equation, written that way:

$$\begin{array}{r} 1 \\ +2 \\ \hline 3 \end{array}$$

All operations in WIZMATH are done in a line from left to right. It looks different, but works just as well.

+	0	1	2	3	(4)	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
(3)	3	4	5	6	[7]	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

This table shows some winning additions. Try adding a number from the first row (4) to a number in the first column (3). Now place your right index finger on the 4, and your left index finger on the 3. Run your right finger down, and your left finger across. The answer (we call it the sum) is in the box where your fingers meet.

[4] [+] [3] [=] [7]

Position Value

To show more than 9 things in the Decimal Number System, use two or more characters. For example, the number 13 represents thirteen ladybugs.

1 3

2nd POSITION 1st POSITION

In numbers with more than one character, each character has a position value. Position values are read from right to left. The 1st position character indicates how many "ones" (from 0 to 9) are in the number, and the 2nd position character indicates how many "tens" (from 0 to 9) are in the number. In the number 13 , the 1st position character represents 3 ladybugs and the 2nd position character represents 1 group of ten ladybugs.

The "ones" position can hold up to 9 "ones," or 9 ladybugs. The "tens" position can hold up to 9 groups of ten, or 90 ladybugs. What then, is the largest number of ladybugs that can be represented by a two-character number? (Answer, 99.)

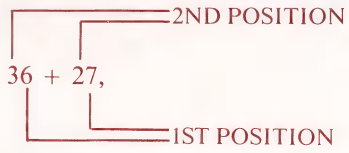
Number Order

You can add numbers in any order, and get the same result.

6 + 5 = 11 5 + 6 = 11

Addition Using Position Values

To find the answer to an addition problem, begin by adding together the 1st position numbers. Then add the 2nd position numbers separately. For example, to add



start with the 1st position numbers to get 6 + 7 = 13.
Next, add the 2nd position numbers, to get 3 + 2 = 5.

36 + 27 = 13 "ones" + 5 "tens."

The 13 will not fit in the "ones" position—it's too big. Only a number in the 0 to 9 range will fit. Try taking a "ten" away from the 13, leaving 3; then add that "ten" to the numbers in the "tens" position.

13 "ones" + 5 "tens" = 3 "ones" + 1 "ten" + 5 "tens"

And. . .

3 "ones" + 1 "ten" + 5 "tens" = 3 "ones" + 6 "tens" = 63

This process of lumping extra "tens" from the 1st position to the 2nd position is called carrying.

This is the column form of the same equation: Note that the "ten" from the 1st position addition is carried over to the 2nd position.

$$\begin{array}{r} {\scriptstyle 1} \\ 36 \\ +27 \\ \hline 63 \end{array}$$

Negative Numbers

It's easy to tell the difference between a negative number and a positive number: negative numbers have a negative (–) sign in front of them.

Negative numbers and positive numbers are exact opposites. ADDING A POSITIVE NUMBER TO ANY OTHER NUMBER ALWAYS GIVES AN INCREASE IN VALUE, WHILE ADDING A NEGATIVE NUMBER ALWAYS GIVES A DECREASE IN VALUE. These examples demonstrate:

[7] [+] [4] [=] [11]
(7 increases to 11 when 4 is added)

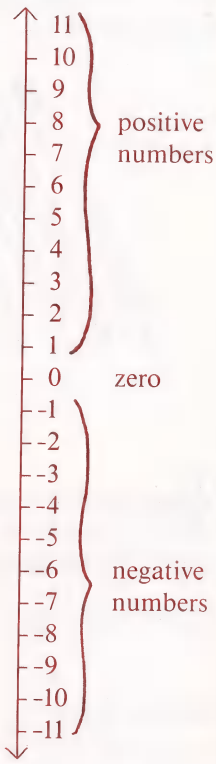
[7] [+] [-4] [=] [3]
(7 decreases to 3 when −4 is added)

[-7] [+] [4] [=] [-3]
(−7 increases to −3 when 4 is added)

[-7] [+] [-4] [=] [-11]
(−7 decreases to −11 when −4 is added)*

*Note: The last equation was added to complete the example. You won't ever see it in WIZMATH, since WIZMATH does not contain or recognize negative numbers below -9.

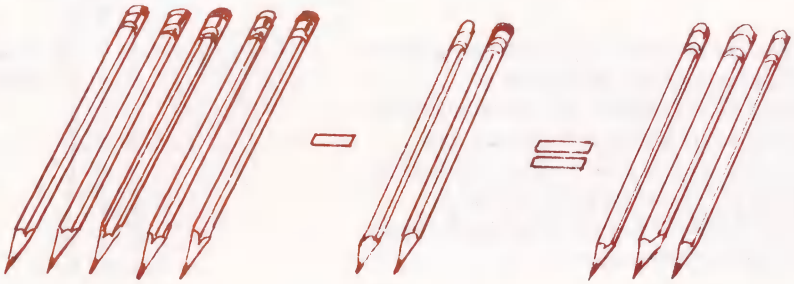
NUMBER LINE



Pick any number on the number line. It will always be larger, or greater, than those below it.

FLOOR 3
Subtraction

When you take one number away from another, you subtract [−] it. For example, if you have ///// and your sister subtracts (takes away) //, you would have /// left. We call the answer to a subtraction problem the difference.



or [5] [−] [2] [=] [3].

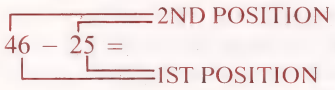
Subtraction of Negative Numbers

When you subtract a negative number, it is the same as if you added a positive number. For instance, just as [5] [+] [3] [=] [8], so does [5] [−] [-3] [=] [8].

It's easy—just treat the subtraction of negative numbers as addition!

Position Value

Subtraction of numbers with one or more characters must be done using **position values**. Let's try this example:



First we do the subtraction in the 1st (or "ones") position: 6 − 5 = 1. Then we do the subtraction in the 2nd (or "tens") position: 4 − 2 = 2. The result then is:

46 − 25 = 1 "one" and 2 "tens," or 21

Borrowing

Sometimes the 1st position number you want to subtract is larger than the other "ones" number you want to subtract it from. In the same way that you gave away (carried) extra "tens" to the "tens" position in addition, sometimes it is necessary to borrow them when you subtract.

When solving the problem

[36] [−] [19] [=],

first you'll want to do the subtraction in the "ones" position. But because 9 is greater than 6, you'll need to borrow a "ten" from the 2nd position of 36. Instead of 30 + 6, the number 36 is then broken down into 20 + 16. Now subtract 9 from 16 to get 7.

When you do the subtraction in the 2nd position, instead of subtracting 1 from 3 you will subtract 1 from 2 (remember, you borrowed 1 "ten"). The final result is:

36 − 19 = 7 "ones" and 1 "ten" = 17.

In column format, the equation looks like this:

$$\begin{array}{r} {}^{2}\not{3}\,{}^{1}\not{6} \\ -\,19 \\ \hline 17 \end{array}$$

borrowed a "ten" to make 16

Notice the way the borrowing process looks.

Number Order

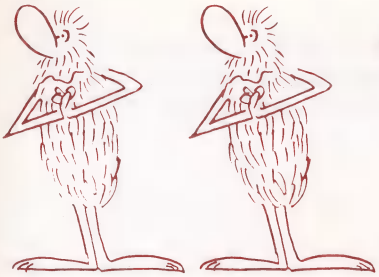
You can add numbers in any order, and get the same result. But a different order in a subtraction problem will result in a different answer, as these examples show.

[6] [−] [5] [=] [1]

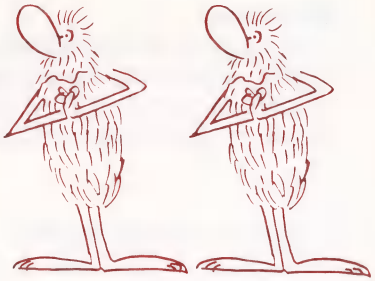
[17] [−] [11] [=] [6]

[5] [−] [6] [=] [−1]

[11] [−] [17] [=] [−6]



FLOOR 4
Multiplication



Multiplication is a shortcut way of adding, using the times [×] block. As an example, [2] [×] [3] [=] [6] means that two 3's are equal to 6 (3 + 3 = 6). When the numbers get larger, multiplication is faster than addition. It is much easier to write

[5] [×] [3] [=] [15] than [3] [+] [3] [+] [3] [+] [3] [+] [3] [=] [15].

You can use a multiplication table to find the result (called the product) of multiplying two numbers. Simply place an index finger on a number in the top row; place the other index finger on a number in the left column. Run one finger down and the other across. The point where your fingers meet is the product of the multiplication.

[4] [×] [3] [=] [12]

×	0	1	2	3	(4)	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
(3)	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

To multiply a number by a two-character number, first multiply that number by the number in the "ones" position, next by the number in the "tens" position, then add the results. To multiply 5 by 12, you write

$$5 \times 12 = \underbrace{5 \times 2} + \underbrace{5 \times 10}$$
$$= \quad 10 \quad + 50 = 60$$

Number Order

Multiplication can be done in any order. The equation $3 \times 4 = 12$ is the same as $4 \times 3 = 12$. When several multiplications are performed in the same equation, the numbers are multiplied two at a time to give a result, then that result is multiplied by the next number, and so forth.

$$\underbrace{2 \times 3} \times 4 \times 3$$
$$= \underbrace{6 \times 4} \times 3$$
$$= \underbrace{24 \times 3}$$
$$= \quad 72$$

Multiplication of Negative Numbers

Whenever numbers with different signs are multiplied together, the result has a negative sign. Whenever numbers with the same sign are multiplied, the result has a positive sign.

−5	×	2	=	−10

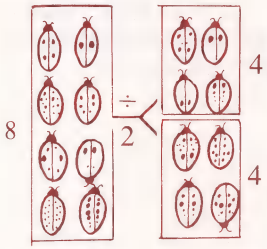
−5	×	−2	=	10

5	×	2	=	10

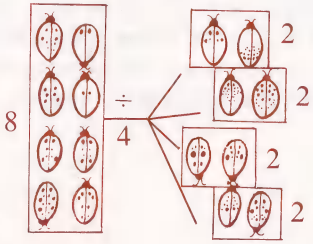
FLOOR 5
Division

Division is a splitting operation represented by the divided by [÷] block. As an example, [8] [÷] [2] means [8] split into [2] equal parts. Since the amount of each equal part is [4], then [8] [÷] [2] [=] [4]. We call the result the quotient.

See how 8 is divided, or split, by 2:



8 can also be divided into 4 equal groups:



Knowing your multiplication tables will help in division since division is the opposite of multiplication (just as subtraction is the opposite of addition). To divide 12 by 3, imagine what number, when multiplied by 3, will give 12. That number is 4, since $4 \times 3 = 12$. Therefore, [12] [÷] [3] [=] [4]. Let's look at other examples:

[12] [÷] [12] [=] [1] since [1] [×] [12] [=] [12]

[12] [÷] [6] [=] [2] since [2] [×] [6] [=] [12]

[12] [÷] [4] [=] [3] since [3] [×] [4] [=] [12]

[12] [÷] [2] [=] [6] since [6] [×] [2] [=] [12]

One rule to remember: you can NEVER divide a number by 0. (You can, however, divide 0 by any other number except 0—the answer will always be 0.)

[12] [÷] [0] [=]

Number Order

Numbers are divided two at a time, from left to right. The first number is divided by the second to give a result. That result is then divided by the next number to give another result, and so on.

$$\underbrace{90 \div 3} \div 3 \div 2$$
$$= \underbrace{30 \div 3} \div 2$$
$$= \underbrace{10 \div 2}$$
$$= 5$$

If the order in which two numbers appear in a division problem is changed, the result changes (unless the two numbers are equal). For instance, 12 ÷ 6 is not the same as 6 ÷ 12.

Division of Negative Numbers

Dividing numbers with different signs gives a negative result. Dividing numbers with the same signs gives a positive result.

12 ÷ -3 = -4

-12 ÷ -3 = 4

-12 ÷ 3 = -4

12 ÷ 3 = 4

Use the multiplication table to solve division equations.

FLOOR 6
Exponentiation

Exponentiation involves the multiplication of a number by itself, using the [^] block. Let's look at an example:

$$3 \text{ ^ } 4 = 3 \times 3 \times 3 \times 3 = 81.$$

The number before the [^] block is the number that is multiplied by itself. The number after the [^] block indicates how many times the number will be present in the multiplication. This second number is the exponent. Exponential expressions are often phrased, "3 to the 4th power" (using the example above).

There are two rules to remember when figuring exponents:

Zero as an exponent: Any number to the 0 power equals 1

[1] [^] [0] [=] [1]
[3] [^] [0] [=] [1]
[25] [^] [0] [=] [1]

One as an exponent: Any number to the 1st power equals that number

[1] [^] [1] [=] [1]
[3] [^] [1] [=] [3]
[25] [^] [1] [=] [25]

Number Order

For two or more exponents, the result is determined stepwise, from left to right. Work out the solution to [2] [^] [3] [^] [2] [=]:

first $2 \text{ ^ } 3 = 2 \times 2 \times 2 = 8$
then $8 \text{ ^ } 2 = 8 \times 8 = 64$

Here are some winning equations:

[4] [^] [3] [=] [64]
[2] [^] [4] [=] [16]
[2] [^] [5] [=] [32]

FLOOR 7
Parentheses

Parentheses [( ] [ )] are used for grouping operations. When more than one operator ([+] , [−] , [×] , [÷]) appears in an equation, the parentheses show which operations are done first. For example:

$$2 \times (4 + 3) = 14$$

because operations inside parentheses are done before any others. Therefore, the first step performed is (4 + 3).

$$2 \times (4 + 3) = 2 \times 7 = 14.$$

Note: without the parentheses, the first operation to be performed would be "2 × 4," which equals 8, and the resulting answer would be 11.

Since all four basic operations appear on this floor, you will want to read the guidelines on Order of Operations (see below) before proceeding very far on Floor 7.

FLOOR 8
Order of Operations

If only one of the [+] or [×] operators is used, operations can be done in any order.

$$3 + 2 = 2 + 3 = 5 \qquad 3 \times 2 = 2 \times 3 = 6$$

As mentioned before, [−] and [÷] operations give different results when the numbers are rearranged.

[6] [−] [2] is not the same as [2] [−] [6]
[6] [÷] [2] is not the same as [2] [÷] [6]

All [×] and [÷] operations must be done (left to right) before any [+] or [−] operations. For example, $1 + 3 \times 4 \div 6 = 3$, because we start with $3 \times 4 = 12$. Then divide that 12 by 6 to get 2, which we add to the 1 to get 3.

FLOOR 9
Binary Numbers

We are used to thinking in terms of the Decimal Number System, based on the number ten. As discussed on Floor 1, the Decimal Number System uses the characters 0 through 9.

The Binary Number System, a system frequently used in the world of computers, is based on the number two. There are only two characters used in the Binary Number System: 0 and 1.

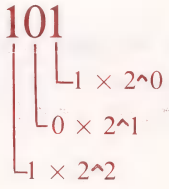
Position values in a number system are based on powers of that number. In the Decimal Number System, the 1st position represents 10^0 (1), the 2nd position represents 10^1 (10), the 3rd position represents 10^2 (100), and so on. In the Binary Number System, the 1st position represents 2^0 (1), the second position represents 2^1 (2), the 3rd position represents 2^2 (4), and so on.

Position Values for Binary Numbers and their Decimal Equivalents

Position	7	6	5	4	3	2	1
Power of 2	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Decimal value	64	32	16	8	4	2	1

The decimal value of a binary number is determined by adding position values from right to left. For example:

$$101 = (1 \times 2^0) + (0 \times 2^1) + (1 \times 2^2)$$
$$= (1 \times 1) + (0 \times 2) + (1 \times 4)$$
$$= 1 + 0 + 4$$
$$= 5$$



Let's look at some Binary numbers, and their Decimal equivalents.

BINARY	DECIMAL
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
1001	9
1010	10
1011	11
1100	12
1101	13
1110	14
1111	15

Binary numbers react just the same as Decimal numbers in mathematical equations.

[1] [+] [1] [=] [10]

[10] [−] [1] [=] [1]

[10] [+] [10] [=] [100]*

[1] [+] [1] [+] [1] [=] [11]

*Note: This equation was added for your information only. WIZMATH does not recognize Binary numbers over 11.

FLOOR 10
Hexadecimal Numbers

It takes four binary characters (1111) to represent the decimal number 15, compared to only two characters in the Decimal Number System! But there are number systems that are even more economical to use than the Decimal Number System.

The Hexadecimal Number System is based on the number 16. Often used in connection with computers, Hex uses these characters:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F
(A=10, B=11, C=12, D=13, E=14, F=15)

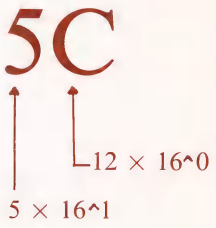
The 1st position of a hexadecimal number shows 16^0 (1), the 2nd position indicates 16^1 (16), the 3rd position indicates 16^2 (256), and so forth.

Position Values for Hexadecimal Numbers and their Decimal Equivalents

Position	3	2	1
Power of 16	16^2	16^1	16^0
Decimal value	256	16	1

The decimal value of a hexadecimal number is determined by adding position values from right to left. For example:

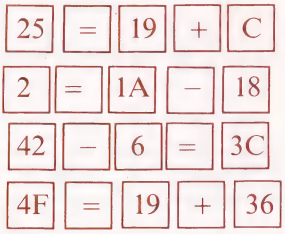
$$5C = (12 \times 16^0) + (5 \times 16^1)$$
$$= (12 \times 1) + (5 \times 16)$$
$$= 12 + 90$$
$$= 102$$



Here are some Hexadecimal numbers, and their Decimal and Binary equivalents:

HEXADECIMAL	DECIMAL	BINARY	HEXADECIMAL	DECIMAL	BINARY
1	1	1	11	17	10001
2	2	10	12	18	10010
3	3	11	13	19	10011
4	4	100	14	20	10100
5	5	101	15	21	10101
6	6	110	16	22	10110
7	7	111	17	23	10111
8	8	1000	18	24	11000
9	9	1001	19	25	11001
A	10	1010	1A	26	11010
B	11	1011	1B	27	11011
C	12	1100	1C	28	11100
D	13	1101	1D	29	11101
E	14	1110	1E	30	11110
F	15	1111	1F	31	11111
10	16	10000	20	32	100000

Here are some winning examples:



Note that in WIZMATH, combinations which give results larger than FF at any stage of evaluation will not work.

FLOOR 11
Boolean Algebra

Boolean Algebra is a system of logic where [T] means True and [F] stands for False. Two operators are used; they are different from any we have used before: [AND] and [OR] . Let's look at some examples of each.

[AND] means that in order for a two-part statement to be True, both parts must be True. For instance, the statement

the sky is blue [AND] the grass is green

is True, since both statements on either side of the [AND] are True. Using the T-F notation, the equation reads

[T] [AND] [T] [=] [T].

However, the statement

the sky is blue [AND] the grass is purple

is False, since the second statement is False. Again using the T-F notation, this equation reads

[T] [AND] [F] [=] [F].

Since [AND] is included in the statement, both halves must be True in order for the whole statement to be True.

The OR operator is more flexible. Only one portion of a two-part statement need be True for the entire statement to be True. To illustrate,

the sky is blue OR the grass is purple

is a True statement, since at least one half of it is true. In other words,

T OR F = T.

On the other hand,

the sky is green OR the grass is purple

is False, since neither statement is True.

F OR F = F

Order

AND and OR statements can be used in any combination.

Always complete AND operations first.

Here are some winning equations:

T AND F AND T = F

T OR F AND T = T OR F

F OR T AND F OR T = T

T = T OR T AND F

FLOOR 12
Introduction to Variables*

A variable is a symbol (usually a letter of the alphabet, such as X or Y) which can represent any number (that's why it's called a variable).

Addition of Variables

When variables are added, the total amount increases. For example,

if you put together with you get

which looks like [3X] [+] [2X] [=] [5X].

Although it is possible to include variables and whole numbers in the same equation, you cannot add variables to whole numbers in all versions. For example, in some versions, the computer will not recognize the equation $4X + 7 - 4X = 7$ because the first operation ($4X + 7$) cannot be performed. But if the same blocks are rearranged to $4X - 4X + 7 = 7$, the computer will accept the equation. (Of course, you know that the first equation is also correct.)

*not in all versions

Subtraction of Variables

When variables are subtracted, the total amount decreases. For instance, if you have 5 X's and 1 X is subtracted, you are left with 4 X's. This is shown as:

or [5X] [−] [X] [=] [4X]

Just as you cannot add variables to whole numbers in all versions, neither can you subtract variables from whole numbers.

Multiplication and Division of Variables

Whole numbers and variables can be multiplied and divided together. Be careful, though, not to multiply variables by variables. This operation is not covered in WIZMATH. Here are some winning examples using multiplication and division:

[3] [×] [2X] [=] [6X]

[9X] [÷] [3X] [=] [3]

[6X] [÷] [2] [÷] [3X] [=] [1]

Note that combinations which give results larger than [9X] at any stage of evaluation, such as the equation [9X] [×] [9] [÷] [3X] [=] [27], will not work in WIZMATH. The result after the first step is 81X, which is unacceptable to the computer.

FLOOR 13
Create and Save Your Own Game*

On this Floor you get to set up your own games to save and play. You can make thousands of combinations using lessons learned on lower floors. Use any number greater than −10 and less than 50. Just be careful not to make any equations that result in fractions.

Select Floor 13 and a chart of blocks available will appear. To select a block, move the cursor to it, then press the "grab block" button (or key). Then move the block around the screen until it is where you want it. Press the "grab block" button again and the list will reappear. Pick other blocks, one at a time, until you get all you want for a game. (Don't line up a complete equation—the computer won't save it!)

If you want to erase a block before you save the game, choose another block and locate it over the first one. Choose a number or an operator, or a blank block.

Press RETURN or ENTER to save the game. Then type in the name of the game. Once saved, a game cannot be revised. To replace a game, create another game and save it under the same name.

For lots of fun and extra challenge, play WIZMATH with a partner. Create games for your partner to play, and have your partner create games for you. This is your big chance to use many of the tricks you learned on the lower floors!

	=	+	−	×	−	(	)	=	
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
	−1	−2	−3	−4	−5	−6	−7	−8	−9

*not on all versions

FLOOR 14
Play Your Own Games*

On this Floor you may play any game you (or anyone else) created and stored on Floor 13. Select Floor 14 and the computer will ask for the name of the game you wish to play. Type in the name, RETURN or ENTER, and the game will appear shortly.

If you cannot remember what you called your lessons, you may catalog the WIZMATH disk for a list of file names. Instructions on how to catalog the WIZMATH disk on Floor 14 are on your reference card.

*not in all versions

WORK PAGE

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